–The current practice and state of the art in the pet containment industry is to use radio waves to detect when a pet such as a dog has come too close to a boundary. In these systems, it is required that the pet owners bury a wire around the perimeter of the boundary and connect a modulated signal generator to the wire loop. The pet then wears a special collar that detects the electromagnetic field emitted from the wire loop and administers a correction signal to the animal when it approaches the boundary. The wire is buried around the perimeter of the yard, and the active zone of the collar can be adjusted by increasing or decreasing the amplitude of the signal generator.–

A2

Please replace the paragraph beginning at page 2, line 4, with the following rewritten paragraph:

--The collar usually contains a two axis pickup coil to detect the magnetic fields around the loop and the necessary electronics to discriminate against noise and amplify and compare signals to produce a high voltage shock. Although these systems are not visible on the property and less laborious to install than a standard post fence, there is still quite a lot of work involved in burying the wire loop. Furthermore, there is a maximum area which can be attained.--

A2

Please replace the paragraph beginning at page 2, line 9, with the following rewritten paragraph:

–In the past, wireless systems have been developed to overcome these problems. For example, U.S. Patent No. 5,381,129 to Boardman describes a system that incorporates transmitting antennas installed on the property and a collar worn by the dog to process the antenna transmissions and deliver an electrical shock when a dog advances to a boundary. However, the complexity and expense of these systems makes them undesirable. Furthermore, the special resolution is limited for precise boundary discrimination.–

Please replace the paragraph beginning at page 2, line 16, with the following rewritten paragraph:

--Prior attempts to produce a GPS based containment system have had limited success, primarily because of their approach. For instance, U.S. Patent No. 6,271,757 to Touchton et al. describes a GPS containment system for pet containment. This system requires an external computer to perform all calculations and decision making. U.S. Patent No. 6,271,757 is related to U.S. Patent No. 6,043,747 and requires a separate portable programming transceiver to program the boundary of a selected confinement area. The programming transceiver must be moved along such boundary during programming. This system requires a collar for wear by the pet and a computer located at a remote base to process the necessary data for the system. This system requires at least two GPS systems for operation.--

A2

Please replace the paragraph beginning at page 3, line 4, with the following rewritten paragraph:

--U.S. Patent No. 6,271,757 describes a GPS based pet containment system whereby the user walks the perimeter with a separate transceiver, and the transceiver simply transmits the coordinates to a Windows based PC located at the house. The PC (Personal Computer) then stores the information in memory and contains software to map out the boundary of the containment area. Furthermore, the system includes a dog collar for transmitting GPS coordinates to the PC, wherein the PC performs all computations and determines whether the dog has breached a safe zone. If there has been a breach, then the PC issues a separate radio signal to the dog collar, which activates a correction signal. Hence, in this system, the collar only relays information and all processing is performed remotely. Thus, this system requires at least two GPS systems. This system includes dog collar containing a GPS receiver and a radio link for the coordinates, a portable programming transceiver with a GPS system including a radio link for the coordinates, a PC, a communication device on the PC and satellite monitoring computer including a GPS system and modem. Furthermore, this invention is operable in only 2 dimensions and all equipment must function in conjunction with the remote PC. To program the boundary, the transceiver requires the operator to press buttons to add containment points, and it must be informed which areas are

safe, and excluded. An added problem with this invention concerns multiple targets. In this embodiment, the control station must address all dogs, and the control station must compute, determine, and execute simultaneously to all dogs in an area through some addressable technique. This solution can be costly and complicated.--

Please replace the paragraph beginning at page 4, line 1, with the following rewritten paragraph:

--Another example, U.S. Patent No. 6,868,100 to Marsh requires a separate boundary definition transmitter to record data to a portable unit and discusses a fixed station for addressing the livestock. For livestock management, all processing is performed at the external processor and only simple area geometries are described.--

Please insert the following paragraph between page 4, lines 5 and 6:

--The present invention features full duplex communication for inputting coordinates, as well as reporting information such as location, speed, medical parameters, and satellite health. The device of the present invention has the capability to call or transmit important information such as location, speed, identity, and medical parameters to a station automatically or when polled. All necessary analog and digital circuitry, (D)GPS hardware, microprocessor, programming, and communications hardware are fully integrated into small device.--

The paragraph beginning at page 4, line 6, has been amended as follows:

--The present invention employs GPS signals. A GPS signal contains a pseudorandom code, ephemeris data and almanac data. The pseudorandom code is simply an I.D. code that identifies which satellite is transmitting information. Ephemeris data, which is constantly transmitted by each satellite, contains important information about the status of the satellite (healthy or unhealthy), current date and time. Ephemeris data is essential for determining a position. The almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits almanac data showing the orbital information for that satellite and for every other satellite in the system.

Additional information regarding GPS can be found at URL: http://www.navcen.uscg.gov/gps/geninfo/global.htm, which is incorporated herein by reference.--

Please delete the line at page 4, line 14.

The paragraph beginning at page 4, line 15, has been amended as follows:

--The present invention provides a totally integrated (D)GPS system with all signal processing, computation and communications on board in a single package. With this device, the need to transmit position signals is unnecessary, thus leading to an economical and portable battery operated position/proximity correction device for use in pet containment. The uses of this device are numerous with applications in land, air and sea navigation, farming, construction, tracking stolen vehicles, keeping track of patients, children and even house arestee's. Important Military applications would include the warning and directing soldiers of front line boundaries, mine-field mapping and 3-D vectoring around MOA's for aircraft navigation to name a few.--

Please replace the paragraph beginning at page 5, line 3, with the following rewritten paragraph:

--It is a more specific object of the present invention to provide a 3-D (D)GPS based boundary position proximity correction device with alarms that is totally integrated into a collar or clothing. The boundary can be mobile. The device has an onboard, embedded microprocessor, a memory, RF electronics, analog and digital circuits and means for two-way communication to a mobile or base station. The device includes components to input two or three-dimensional coordinates and software to operate the device. The alarms can be correction signals such as an electrical shock, audible, voice or a feedback control system for navigation. When the boundary is approached, the device can contact a mobile or base station to alert authorities and transfer important information such as the identity, location, speed and physiological parameters of the subject. The base station can also poll the device and download new coordinates, if desired.

A4

A4

Each collar can also be defined as a mobile boundary, by which communication between collar subjects can define additional boundaries to avoid or remain close.--

Please delete the paragraph beginning at page 5, line 16.

Please delete the paragraph beginning at page 6, line 1.

Please delete the paragraph beginning at page 6, line 6.

Please delete the paragraph beginning at page 6, line 13.

Please delete the paragraph beginning at page 7, line 8.

Please delete the paragraph beginning at page 7, line 10.

Please delete the paragraph beginning at page 7, line 17.

Please delete the paragraph beginning at page 8, line 3.

Please delete the paragraph beginning at page 8, line 11.

Please delete the paragraph beginning at page 8, line 13.

Please delete the paragraph beginning at page 8, line 18.

Please delete the paragraph beginning at page 9, line 5.

Please replace the paragraph beginning at page 9, line 7, with the following rewritten paragraph:

NE --In the following, a GPS proximity detector with alarm according to the present invention is described.--

Please replace the line at page 9, line 9 with the following line:

BRIEF DESCRIPTION OF THE DRAWINGS

Please insert the following lines on page 9, between lines 9 and 10:

A5

--Exemplary embodiments of the invention will now be explained with reference to the accompanying drawings, of which:--

Please replace the paragraph beginning at page 9, line 10, with the following rewritten paragraph::

--Figures 1-1c are schematic views of exemplary environments for utilizing the device of the present invention;--

Please replace the paragraph beginning at page 10, line 1, with the following rewritten paragraph:

--Figure 2 is a perspective view of a device according to an embodiment of the present invention;--

Please replace the paragraph beginning at page 10, line 7, with the following rewritten paragraph:

--Figures 3 and 4 are schematics of components for use with the present invention;--

Please delete the paragraph beginning at page 10, line 15.

Please delete the paragraph beginning at page 11, line 1.

Please replace the paragraph beginning at page 11, line 4, with the following rewritten paragraph:

--Figure 5 is a perspective view of a base station according to an embodiment of the present invention;--

Please replace the paragraph beginning at page 11, line 12, with the following rewritten paragraph:

--Figure 6 is a perspective view of different objects for utilizing a device of the present invention;--

Please replace the paragraph beginning at page 11, line 15, with the following rewritten paragraph:

--Figures 7, 8, and 9 are schematic views of components of the present invention;--

Please insert the following paragraph between page 11, lines 16 and 17:

--Figure 10 is a chart of phrases included in the embedded software of the present invention;

Figure 11 is flow chart of the training phrase of the present invention;

Figure 12 is a flow chart of the implementation phrase of the present invention;

Figure 13 is a schematic diagram of connections between various components of the present invention;

Figures 14A-15C are a schematic diagrams of exemplary training laps

Figure 16 is a schematic diagram of a perimeter and a subject; and

Figures 17 and 18 are schematic diagrams of geometric formulas for determining the distance to a perimeter._--

The paragraph beginning at page 11, line 18, has been amended as follows:

--The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which the preferred embodiments of the invention are shown. This invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and fully convey the scope of the invention to those skilled in the art.--

Please insert the following paragraphs on page 12, between lines 4 and 5:

--Referring to Figure 1, a schematic view of the environment for utilizing the device of the present invention is illustrated. In this configuration, the module is used to keep a pet inside a defined boundary. Note that there are many embodiments that this programmable device will apply. Just a few examples are listed in Figures 6A through 6E, described below. In each example, the boundary volume is defined with safe zones 11, unsafe zones 12, soft zones, dynamic zones 101, and hysteresis zones 21. The dynamic zones could represent moving aircraft on the ground or in the air. Similar systems such as TCAS operate off aircraft transponders and are disabled near the ground.

This invention is applicable in the air or on the ground. In these examples, two way communications collar 1 to collar 1, or collar to base 16 are established, and specific algorithms are incorporated to notify a station when a subject has crossed a boundary, or to apply a corrective or warning signal. Subjects can be included in a boundary, excluded in a boundary, the union of multiple boundaries can be arranged.

In one embodiment, the collar can contain a module 106 shown in Figure 3 manufactured by μ-BLOX™ in Zurich, Switzerland. The GPS-MS1E-AT is a fully self-contained receiver module based on the SiRFstar™ chip set with a Hitachi risk microprocessor. For development, an evaluation kit such as the u-blox can be purchased GPS-MS1E-SCK with a Hitachi™ C compiler, which was included in the

customization kit. This system contains all the command sets necessary to modify the μ-BLOX programming codes for a particular task. The μ-BLOX™ MS1E-AT also has the capability to transmit the module coordinates through it AT command set. Not limiting this invention to a particular method of transmitting, the AT system in communication with, but not limited to, a GSM type modem as one such method to real time track the position of an animal, person, or thing with the ability to immediately locate the subject. In this mode, the subject's location can be found in the specified boundary, when it crosses a boundary, or when it is polled to report a location. The subject can also request poll in particular uses such as illustrated in Figure 6E, described below. Here, a patient can activate the collar for requested assistance. For hunting dogs, it may not be necessary to use the one or both alarms, and the position and velocity of the animal could be polled any time. By using velocity and acceleration vectors, position estimates can be calculated.

Antenna 3 is currently an active microstrip antenna. However, it could be a passive antenna or an antenna loop embedded in the collar of the animal or structure.

There are many ways to program the GPS module. For instance, in one method, a laptop or other portable computer system known to those of skill in the art can plug into collar port 7. In this mode, the laptop can download the coordinates from the boundary into the collar where the coordinates can be stored in a memory. In another method, the coordinates could be manually entered and loaded into the collar through port 7. In another embodiment, a mapping extracted from a web-based application such as the GIS system could be used to download three-dimensional coordinates, and the collar 7 would then specify the volume of interest and store the data.

In a preferred embodiment of training, the microprocessor in the collar can handle all the calculations. In this preferred embodiment, the collar is placed on the pet and the pet would walk around the boundary. During this walk, the collar can read the location coordinates and store the coordinates in the proper memory slot in the onboard computer. The embedded software then stores and maps the boundary

during this "training phase". In the operational phase, the embedded processor reads the 3-D coordinates, compares these real-time coordinates to the boundary or surface, and sounds a plurality of alarms when the subject approaches the boundary.

The embedded processor can also analyze the site to make sure that the reception is satisfactory for use. In the event that a weak signal was detected, steps could be undertaken to solve the problem. In one design, "SignalView" program could simply incorporate the use of an output pin 110, 111 on the GPS-MS1E of Figure 3. This pin detects faulty satellite operation and can idle the system until good satellite data is observed. The MS1E like many systems has a "trickle power" feature. In the event that the animal is asleep, and no movement is detected, the GPS module would also go to sleep to conserve power. Upon detecting animal movement, the processor would become more active.

For enhanced operation, this system is DGPS ready. In this example, RF communications can transmit the coordinates of a base station in RTCM SC-104 format to the port on the collar.

In the operation phase, a coordinate is read from the satellites. Next, the software compares the coordinate to the list stored during the training phase, and finds the closest queue point. Then, through 3-D triangulation, the μ-BLOX GPS-MS1E decides if the subject is within bounds. In the event that the subject ventures out of bounds, the system will have the ability to report to a base station the coordinates of the module and take evasive action.

The base station shown in Figure 5, described in more detail below, is used for two-way communication between the collar and a base camp. This station can be a cell phone with the proper programming. The station can also be used as stationary differential GPS correction device since the location of the station will be precisely known. In this mode, any error in the received GPS signals are passed along the collar when operated in the differential mode. Alternatively, the Nationwide Differential GPS service can allow differential mode to be incorporated in the operation of the collar without a plurality of receivers.--

Please replace the paragraph beginning at page 12, line 5, with the following rewritten paragraph:

--A fully integrated (D)GPS electronic boundary proximity system shown in Figure 1 is provided for animals, objects, for tracking movement, reporting coordinates, and taking evasive action relative to a selected containment volume. As shown Figures 1b and 1c, the main boundary 9 can be three dimensions. Attached to each animal 6E is a fully integrated (D)GPS collar 1, and surrounding the pet is a volume 101 referred to as the "object space". The object space 101 can be uniquely defined by a vector V 102 representing the object space as a point. Satellites 103 transmit and receive signal from collar 1 and possibly a base or mobile station 16. In this invention, collar 1 processes the information received from satellites 103 to detect a boundary space 105 defined by a multiple of areas such as 9, 10, corridor 11, exclusion zones 12, soft zones 21, and exterior zones 14. All areas can be represented by lines for two-dimensional representation, or surfaces for volumetric representations as indicated in Figure 1. Two-way communications antennas 9 are included on collars 1 and the base station 16.--

Please replace the paragraph beginning at page 12, line 17, with the following rewritten paragraph:

--Referring to Figure 2, an illustration of a collar 1 for defining a containment volume is illustrated. The collar receives (D)GPS signals from satellites 103 and processes the raw data into x,y,z position coordinates. The collar system consists of an attachment device such as a leather band 1, an electronic module 2, a GPS antenna 3, a communication antenna 9, a digital port 7, wiring 8, a correction stimulating device 4, high voltage prongs 6 and an audible signal generator 5. Both communication antenna 9 and GPS antenna 3 can be integrated into a single antenna for consolidation purposes. Antenna 9 is operable to provide a two-way data link. A single antenna can serve the purpose of both the GPS and communications network. Conducting prongs 6 are powered by a watch battery and the necessary high voltage circuitry for delivering an electrical shock. Port 7 is a computer port for allowing

communication with the GPS module to download coordinates or uploading data from the GPS-MS1E-AT-DL datalogger. Wire 8 is necessary to electrically connect the electronic module with the GPS module and contains power and a signal to switch the alarms on and off. The collar is attached to an object such as an aircraft, or a pet as indicated in Figures 6A-E.--

Please replace the paragraph beginning at page 13, line 3, with the following rewritten paragraph:

--Referring to Figures 3 and 4, different schematic views of a (D)GPS module, generally designated 106, are illustrated. The collar can be based on many manufactures of GPS electronic parts. Figures 3A – 3B illustrate one such system: a GPS-MS1E-AT manufactured by µ-blox. Module 106 contains a microprocessor 107, memory 108, RF section 109, a GPS antenna 3, eight IO ports 110 such as RS232 or USB, and two GPIO ports 111. Alternatively, ports 111 can be linked by any standard method such as cable, infrared, wireless serial or parallel. In the preferred embodiment, all electronics are integrated into the collar as shown in Figures 7, 8, and 9. In this example, the (D)GPS 106, communications module 107, correction 4, and supporting electronics 108 modules have been integrated into a single package 2 (shown in Figure 2). The E1 contains all necessary electronics to build a "large area proximity detector with alarms". After programming chip 106, it is placed in the portable application device or collar 1. The programmer is housed in the E1 box, which module 106 is inserted. By utilizing the input/output pins inside the programmer, attaching the antenna and communicating through the ports, this device can be developed. --

Please insert the following paragraph between page 13, lines 8 and 9:

--By adding an antenna, a battery, and downloading the code to the module, boundary identification can begin. GPS chip 106 is slightly larger than a postage stamp and in particular is 30.2mm x 29.5 mm x 7.55 mm and is positioned into a standard 84 pin PLCC.--

Please replace the paragraph beginning at page 13, line 9, with the following rewritten paragraph:

--Referring to Figure 7, a schematic diagram of a communications module is illustrated. Communications module 107 can be based on any wireless method of communication. Several such limited examples such as CDMA, TDMA, FDMA are well known to one skilled in the art. In one embodiment, GSM techniques could be incorporated using off the shelf parts. For integration with the u-blox system, one embodiment would require a GPS receiver (GPS-MS1E-AT), a GSM modem supporting AT interface (GSM 07.05,07.07) and a controller. The controller reads positions from the GPS receiver and controls the on board digital modem.--

Please delete the drawing beginning at page 14, line 1.

Please delete the drawing beginning at page 16, line 1.

Please replace the paragraph beginning at page 16, line 2, with the following rewritten paragraph:

--Referring to Figure 13, a schematic diagram of the connections between various components of the present invention. To transmit the coordinates back to the base station, action can be triggered by the use of the AT Firmware. GPS-MS1E-AT communicates with a GSM modem via the AT-standard (GSM 07.05, 07.07). Firstly, the action *RX* turns on the GPS modem, that means sending the action *RX* to the modem awakes the modem and enables it to receive calls or SMS. The action *Data Call* then opens a data connection to a host. There are two modes used for data calls. In data mode you can send the same requests to the module as in SMS, a request also has to be sent at least every 30s to keep the connection alive. In online mode you will have to answer "sense" messages to keep the connection up. If a data connection is opened, the AT-Firmware enters data mode. Data will eventually be transferred back to the requested host by the configuration protocols, which the AT-Firmware uses to communicate with hosts.--

Please replace the paragraph beginning at page 16, line 18, with the following rewritten paragraph:

--Before a modem can be used with the AT option, the modem has to be configured. A PC with a serial port and a terminal program is needed to do this. First, the modem has to be connected to a serial port of the PC and the terminal program has to be opened on that serial port. Normally after applying power, a switch on signal has to be generated to turn on the modem. Sending AT<CR> should cause the modem to answer with OK<CR><LF>. If strange characters are returned the baud rate of the serial port is wrong. If nothing is returned, the serial connection may be broken or the modem is not on. There are external wires that must be connected to the modem. If we want to use a mobile phone with AT interface, you probably do not have access to the on/off reset signal. If we do not connect the on/off and reset lines(not recommended), we have to activate no power up mode in the configuration.--

Please replace the paragraph beginning at page 17, line 9, with the following rewritten paragraph:

--The command set used by the Hayes Smartmodem 300™, as well as most modems today (with a few advanced commands), is known by those of skill in the art as the AT command set. AT stands for attention, and precedes all (with the exception of A/) commands directed to the modem. For example, when dialing, it is necessary for either the software or the user to issue an ATDT or ATDP command followed by the number and enters. AT tells the modem that it is about to receive a command. DT tells it to dial by tone, while DP tells it to pulse dial.--

Please replace the paragraph beginning at page 17, line 17, with the following rewritten paragraph:

--Finally, the modem dials the number given to it after the command. Different modems do have slightly different command sets, but generally most modems follow the Hayes standard.--

Please replace the paragraph beginning at page 18, line 4, with the following rewritten paragraph:

--Referring to Figure 5, a perspective view of a base/mobile station 16 is illustrated. Base/mobile station 16 contains a readout screen 19, a communications

antenna 17 and all the necessary hardware to communicate with collar 1 (not shown). Readout screen 19 can be an LCD in order to read and map the coordinates when the collar is polled and for any diagnostics needed on the base station. Station 16 can be a stand-alone unit or a wireless phone with location capabilities and of the new 3-G design. The capability to reprogram individual collars in the field and manage a heard is built into the station. However, each collar can communicate with other collars eliminating the need for exterior management. In one embodiment, the base station can be used as a differential station whereby it would include a GPS module [18] 106 (not shown). Here using standard differential methods, corrections could be passed to collar 1 through antenna 17. The base station could also be used to download new boundary coordinates to a subject 20 wearing collar 1. This would be especially useful in military operations to adjust front line boarders, or send coordinates of dangerous areas such as mine fields.--

Please replace the paragraph beginning at page 18, line 12, with the following rewritten paragraph:

-- In one embodiment, the correction module 4 is in communication with both the GPS chip 106 and communications hardware 107. For pet containment, and livestock control, the correction hardware consists of an audible device 5 and/or a behavior modification device such as a high voltage stimulus 6. Referring to Figure 9, a schematic diagram of a typical correction device is illustrated. LM 317 adjusts the intensity of the shock supplying a pulsar based on the LM 555 timer necessary to excite transformer 116, and 114 is a MOSFET switch for isolation. When the MS1E detects that a subject is dangerously close to a boundary, it will activate an IO line 110 internal in 106 and after signal conditioning, will transmit through 8 a correction signal. This signal could be audible as in 5, or a shock such as 6. In the event that the correction hardware was to take control of a situation, the feedback control data link 116 (shown in Figure 8) would upload or transmit any signals necessary external to the module 106.--

Please replace the paragraph beginning at page 19, line 1, with the following rewritten paragraph:

--In the training phase, collar 1 has the capability to define a volume as in Figure 1b, 1c while in the implementation phase, collar 1 can communicate to a base station 16 or to another collar 1. This information may consist of an exchange in coordinates, change in coordinates, rates of change of coordinates, or information such as identity and physiological parameters of the object. With this system, each object 20 can be defined as a volume ΔV 101 and have its centroid coordinates 102 passed from collar 1 to collar 1 or to a station such as 16 (shown in Figure 1). The coordinates may be transmitted continuously, non-continuously, or when polled by another collar 1 or the base station16.--

Please replace the paragraph beginning at page 19, line 12, with the following rewritten paragraph:

--In the preferred embodiment, collar 1 is worn by a pet and accepts GPS signals through antenna 3 and processes them through RF section 108. These signals are digitized to produce location coordinates, which are stored in memory 108. A computer program also stored in memory 108 has the ability to operate on these coordinates as a function of time and space. A flow chart for this program is shown in Figure 10-12 and described in more detail below.--

Please replace the paragraph beginning at page 19, line 17, with the following rewritten paragraph:

--All analog and digital support electronics are also placed inside electronic module 2 as indicated in figure 2 & 8. This section also contains analog and digital electronics batteries, necessary to support the communications section of electronic module 2, power any antennas as well known by one skilled in the electronics area.--

Please replace the paragraph beginning at page 20, line 17, with the following rewritten paragraph:

--Qualcomm Incorporated, pioneer and world leader of Code Division Multiple Access (CDMA) digital wireless technology, produces the RFR3300™, an RF-to-IF

(radio frequency to intermediate frequency) front-end receiver designed for cellular, personal communications service (PCS) and Global Positioning System (GPS) signal processing [in May 2000]. The RFR3300™ device is the first in the CDMA industry to integrate GPS capability with a CDMA front-end receiver.--

Please replace the paragraph beginning at page 21, line 3, with the following rewritten paragraph:

--The RFR3300™ device is silicon germanium (SiGe) BiMOS radio frequency integrated circuit (RFIC) that provides high linearity with very low power consumption. The advanced integration of a GPS receiver into a CDMA/AMPS receiver eliminates the need to add an extra stand-alone GPS RF receiver. Together with Qualcomm's MSM3300 Mobile Station Modem (MSM)™ chipset and IFR3300 baseband receiver, the RFR3300™ device offers the cost-effective and high-performance solution for dual-band (PCS CDMA and AMPS) or tri-mode (cellular CDMA, AMPS, and PCS CDMA) phones with Qualcomm's gpsOne™ position location technology. The gpsOne solution offers robust data availability under challenging conditions, such as in concrete-and-steel high-rises, convention centers, shopping malls or urban canyons.--

Please replace the paragraph beginning at page 21, line 12, with the following rewritten paragraph:

--Qualcomm's RFR3300™ device integrates dual-band low noise amplifiers (LNAs) and mixers for downconverting from RF to CDMA and FM IF, and contains a dedicated LNA and mixer designed for downconverting global positioning system (GPS) signals from RF to IF. The RFR3300™ receiver operates in the 832 MHz-894 MHz cellular band, 1840 MHz-1990 MHz PCS band and 1575 MHz GPS band. The RFR3300™ device meets cascaded Noise Figure (NF) and Third-Order Input Intercept Point (IIP3) requirements of IS-98 and JSTD-018 for sensitivity, and two-tone intermodulation. The RFR3300 ™ solution was also designed to meet the sensitivity requirements of gpsOne™.--

Please replace the paragraph beginning at page 21, line 20, with the following rewritten paragraph:

--The cellular LNA in the RFR3300™ device offers gain control capability for improving dynamic range and performance in the presence of high levels of interference. Reducing the gain in the LNA also improves power consumption. Band selection and gain modes are controlled directly from the MSM3300™ chip. The RFR3300™ device is designed for use with voltage ranges from 2.7 V to 3.15 V, and is available in a 5 millimeter by 5 millimeter 32-pin BCC++ plastic package.--

Please replace the paragraph beginning at page 22, line 4, with the following rewritten paragraph:

--The MSM3300™ chipset is comprised of the MSM3300™ CDMA modem, RFT3100™ analog-baseband-to-RF upconverter, IFR3300™ IF-to-baseband downconverter, RFR3300™ RF-to-IF downconverter — the first front-end receiver in the industry to incorporate GPS capabilities in a CDMA chipset — PA3300™ power amplifier, PM1000™ power management device and the SURF3300™ development platform. QCT's gpsOne™ technology is integrated on the MSM3300™ chip, which provides all of the position location capabilities without the need for additional chips, reducing board space and potential size of the handsets. QCT's gpsOne™ solution, featuring SnapTrack™ technology, offers robust data availability under the most challenging conditions, whether in concrete-and-steel high-rises, convention centers, shopping malls or urban canyons. Using a hybrid approach that utilizes signals from both the GPS satellite constellation and from CDMA cell sites, the gpsOne solution enhances location services availability, accelerates the location determination process and provides better accuracy for callers, whether during emergency situations or while using GPS-enabled commercial applications. The gpsOne™ solution deployed by KDDI is supported by SnapTrack's SnapSmart™ location server software, which provides the core position calculation function for KDDI's eznavigation service. Additional information regarding the MSM3300™ chipset can be found at URL: http://www.cdmatech.com/solutions/pdf/msm3300generation.pdf and http://www.cdmatech.com/solutions/pdf/positionlocation.pdf, which are incorporated herein by reference.--

Please delete the line at page 22, line 19.

Please delete the line at page 22, line 20.

Please replace the paragraph beginning at page 22, line 21, with the following rewritten paragraph:

--There are many technologies available for the communication as well as the GPS location electronics. For instance, the Qualcomm MSM3300 chipset has communications and location capability all in a single chipset. This system is based on (WA)GPS or "hybrid positioning" incorporating both cell phones and GPS. In another embodiment, "Bluetooth" could be used for communication for short range applications, less than 100m. The protocol for the communications system is also standard and could rely on Global System for Mobile Communications (GSM), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Frequency Division Multiple Access (FDMA), or other suitable protocols known to those of skill in the art.--

Please delete lines 6-12 at page 23.

Please replace the paragraph beginning at page 24, line 8, with the following rewritten paragraph:

--Referring to Figure 10, a chart of phases included in the embedded software of the present invention is illustrated. The embedded software consists of three phases: a training phase (shown in Figure 11), an implementation phase (shown in Figure 12), and a communication phase. Referring now to Figures 1, 2, and 6, in a preferred embodiment, collar 1 is all that is needed to define a boundary or volume. Collar 1 is simply walked around the boundary 105 in a manner such that the coordinates are received from satellites 103, stored in the onboard computer in 106. In this example, the coordinates are read from the satellite and stored in the collar 1 each second. It initiates the training phase, the user begins at a "home point" which is arbitrary and the training phase is initiated. This initiation could start by activating an internal switch in collar 1, or by activating a soft switch using port 7 on the collar. For example, the 3 coherent light pulses shined into port 7 could act as a software switch

to begin the training mode, and 3 long pulses and 3 short pulses could be used to activate a diagnostics mode. Using the window soft switch will allow designs more robust to the outside environment.--

Please replace the paragraph beginning at page 24, line 20, with the following rewritten paragraph:

--Figure 11 is a limiting example of the flow programmed into collar1. In this example, collar 1 is initiated into the training phase using soft switch 7, 7b. At this point, the home coordinates are recorded and collar 7 begins collecting x,y,z coordinates and comparing them to previous coordinates. If the coordinates have not changed, the program ignores, but continues to receive coordinates. Here, each coordinate is compared to a multiple of coordinates stored in the queue. If the angle between the new coordinate and the set of points in queue 204 is greater than some previously defined angle such as 150 degrees, the coordinate is stored and the collar continues to process a new point. In the event that the coordinate is found to be close to the home coordinate, the collar automatically stops the process and identifies the boundary as boundary 1.--

Please replace the paragraph beginning at page 25, line 16, with the following rewritten paragraph:

-- Three-dimensional volumes as illustrated in Figure 1c are programmed in much the same way. In one embodiment, an area 117 is programmed into collar 1, then again over another area 118 at a different altitude or z component. The software would then assign a secure/un-secure area to the volume defined between the two areas. Figures 1b and 1c is an illustration of a three dimensional volume defined by this method. Parametric equations could also be incorporated to define surfaces. Conversely, the secure area could be outside of this defined area as opposed to the interior of it. Here, aircraft would be alerted that they were approaching a hazard space, and the correction hardware would warn the pilots or automatically take control by the feedback system 116. 3-D volumes would also have the ability to form the union of two spaces, allow corridors between spaces, and allow the definition of

interior volumes within a volume. For terrestrial 3-D mapping, the collar 1 could simply be walked around an area such as 105 in figure 1, and then walked around upstairs 119 in the house as shown in Figure 1. Here, the secure zone could be defined as certain areas upstairs 119, and the defined area 105. Anything not defined within a volume could default to either a secure or a hazard zone.--

Please replace the paragraph beginning at page 26, line 13, with the following rewritten paragraph:

-- In still another embodiment of the present invention, the coordinates could be downloaded in collar 1 using port 7. In this example, coordinates could be keyed into a device such as a PDA, laptop, or base/mobile station shown in Figure 5, and through the communication software downloaded by radio through antenna 17. In this manner, space 105 is dynamic and fully programmable and addressable to each collar1.--

Please replace the paragraph beginning at page 26, line 18, with the following rewritten paragraph:

-- Figure 5 illustrates the base/mobile station. Device 16 contains a microprocessor, a display, communication module 17, and a GPS module 18. In one example, the base/mobile station could be used for a differential station where the coordinates are precisely known. By reading its position from satellites 103, any error correction can be passed to collar 1 for enhanced accuracy. Display 19 could simply be a LCD the shows the parameters such as location, speed and diagnostics, or it could display the 3-D airspace and the proximity of an object to this display. Using the display, a collar programmer can see the defined space, and check for errors before downloading the boundary coordinates to collar 1.--

Please replace the paragraph beginning at page 27, line 6, with the following rewritten paragraph:

--When the collar has detected that the training phase has been completed, it switches to the run mode. In this mode, when subject 20 surrounded by an object volume 101 (see Figure 1) approaches the boundary 105, a series of corrective actions take place. For instance, when object 20 is 2 meters from boundary 105 I/O a

line in 110 goes high and an audible signal 5 is produced. When the object is 1 meter from the boundary, a second I/O line goes high, and a more serious correction signal such as a shock takes place. Simultaneously, the communications software initiates a call from 20 and through port 9 sends the location data to base station 16.--

Please delete the line at page 29, line 13.

Please delete the line at page 30, line 1.

Please delete the line at page 30, line 2.

Please delete the drawing beginning at page 30, line 3.

Please replace the paragraph beginning at page 30, line 4, with the following rewritten paragraph:

--Referring to Figure 14A – 14C, schematic diagrams of training laps for a rectangular shaped perimeter are illustrated. Once a coordinate is acquired, the angle between that coordinate and the last acquired coordinate is calculated and if it is less than our threshold angle (151 degrees) that coordinate is stored in the queue.--

Please delete the line at page 30, line 7.

Please delete the line at page 30, line 8.

Please delete the drawing beginning at page 30, line 9.

Please delete the line at page 31, line 1.

Please delete the line at page 31, line 2.

Please delete the drawing beginning at page 31, line 3.

Please replace the paragraph beginning at page 31, line 4, with the following rewritten paragraph:

--Referring to Figures 15A – 15C, schematic diagrams of training laps for a circular shaped perimeter are illustrated. Of course, the possibility exists that our area perimeter is not a rectangle. For instance, if our perimeter is a circle, we would end up with a few coordinates but not enough coordinates to get the correct shape of the boundary.--

Please delete the phrase at page 31, line 7.

Please delete the drawing beginning at page 31, line 8.

Please delete the phrase at page 32, line 1.

Please delete the drawing beginning at page 32, line 2.

Please delete the phrase at page 33, line 1.

Please delete the phrase at page 33, line 2.

Please delete the drawing beginning at page 33, line 3.

Please delete the phrase at page 33, line 5.

Please delete the phrase at page 33, line 6.

Please delete the drawing beginning at page 33, line 7.

Please replace the paragraph beginning at page 34, line 1, with the following rewritten paragraph:

–Referring to Figure 16, a schematic diagram of a perimeter and a subject is illustrated. Once the boundary is stored in the collar 1, the device automatically jumps to the run phase where coordinates from satellites 103 are used to detect the position of subject 20. An example is provided in Figure 16.—

Please delete the phrase at page 34, line 3.

Please delete the phrase at page 34, line 4.

Please delete the drawing beginning at page 34, line 5.

Please replace the paragraph beginning at page 35, line 1, with the following rewritten paragraph:

--Referring to Figure 17, a schematic diagram of a geometric formula for determining the distance of a subject to a perimeter is illustrated. In the following calculations, triangulation is used to determine the animal's distance to the boundary. If the subject is represented by the coordinates (x0, y0) in the basic geometric formula following, the distance between (x0, y0) and (x2, y2) is given by:--

Please delete the drawing beginning at page 35, line 3.

Please delete the line at page 35, line 9.

Please delete the drawing beginning at page 36, line 1.

Please delete page 36, lines 2-4.